Mathematics Test 2 of ACT

Algebra 1 or Algebra 2(17%) (10 to 11 questions) Questions in this content area are based on properties of exponents and square roots, evaluation of algebraic expressions through substitution, using variables to express functional relationships, understanding algebraic operations, and the solution of quadratic equations by factoring.

EXAMPLES

Properties of Exponents and Square Roots

22. For all $a > 1$, the expression $\frac{3a^4}{3a^6}$ equals:

F. $\frac{1}{2}$

G. $-a^2$

H. a^2

J. $-\frac{1}{a^2}$

K. $\frac{1}{a^2}$

35. $(3x^3)^3$ is equivalent to:

A. x
B. $9x^6$
C. $9x^9$
D. $27x^6$
E. $27x^9$

36. Which of the following is equivalent to the inequality $4x - 8 > 8x + 16$?

F. $x < -6$
G. $x > -6$
H. $x < -2$
J. $x > 2$
K. $x < 6$

40. If there are 8×10^{12} hydrogen molecules in a volume of 4×10^4 cubic centimeters, what is the average number of hydrogen molecules per cubic centimeter?

F. 5×10^{-9}
G. 2×10^3
H. 2×10^8
J. 32×10^{16}
K. 32×10^{48}

45. Which of the following is a rational number?

A. $\sqrt{2}$

B. $\sqrt{\pi}$

C. $\sqrt{7}$

D. $\sqrt{\frac{5}{25}}$

E. $\sqrt{\frac{64}{49}}$

49. In the real numbers, what is the solution of the equation $8^{2x+1} = 4^{1-x}$?

A. $-\frac{1}{3}$

B. $-\frac{1}{4}$

C. $-\frac{1}{8}$

D. 0

E. $\frac{1}{7}$

YOU TRY Properties of Exponents and Square Roots:

1. The value of $(2.5 \bullet 10^5)^2$ is equal to which of the following?

F. $6.25 \bullet 10^7$
G. $6.25 \bullet 10^{10}$
H. $2.5 \bullet 10^{10}$
J. $2.7 \bullet 10^{10}$
K. $5 \bullet 10^7$

2. What is the solution of $2^{x2 + 2x} = 2^{-1}$?

F. 1
G. -1
H. 1 and -1
J. 2
K. no solution

3. $\frac{10^3(10^5 + 10^5)}{10^4} = ?$

F. 10^4
G. 10^6
H. $2(10^2)$
J. $2(10^4)$
K. $2(10^9)$

4. $2^0 + 2^3 - 2^{-2} = ?$

A. 4
B. $6\frac{1}{4}$
C. 7
D. $8\frac{3}{4}$
E. $9\frac{3}{4}$

Evaluation of Algebraic Expressions through Substitution

1. What is the value of the expression $6x - [7 - 2(3x - 10)]$ when $x = 5$?

A. -27
B. -17
C. 13
D. 33
E. 87

2. When $x = -2$, what is the value of $x^3 - x + 3$?

A. -5
B. -3
C. -1
D. 9
E. 13

Using variables to express functional relationships

2. A consultant charges $45 for each hour she works on a consultation, plus a flat $30 consulting fee. How many hours of work are included in a $210 bill for a consultation?

F. 2
G. 4
H. 4
J. 5
K. 7

24. The fixed costs of manufacturing basketballs in a factory are $1,400.00 per day. The variable costs are $5.25 per basketball. Which of the following expressions can be used to model the cost of manufacturing *b* basketballs in 1 day?

F. $1,405.25*b*
G. $5.25*b* - $1,400.00
H. $1,400.00*b* + $5.25
J. $1,400.00 - $5.25*b*
K. $1,400.00 + $5.25*b*

27. A hot-air balloon 70 meters above the ground is falling at a constant rate of 6 meters per second while another hot-air balloon 10 meters above the ground is rising at a constant rate of 15 meters per second. To the nearest tenth of a second, after how many seconds will the 2 balloons be the same height above the ground?

A. 8.9
B. 6.7
C. 2.9
D. 0.4
E. 0.2

58. For every positive 2-digit number, x, with tens digit t and units digit u, let y be the 2-digit number formed by reversing the digits of x. Which of the following expressions is equivalent to $x - y$?

F. $9(t - u)$
G. $9(u - t)$
H. $9t - u$
J. $9u - t$
K. 0

YOU TRY Using variables to express functional relationships:

1. Guillermo earns take-home pay of \$6.75 per hour. Out of his next paycheck, he would like to buy 3 books for \$7.48 each and rent 4 video games for \$5.34 each (both prices include tax). Let n represent the number of hours for which Guillermo is paid on his next pay-check. Which of the following inequalities, when solved, gives the values of n that allow Guillermo to buy the books and rent the video games?

F. $7.48 + 5.34 \leq n$
G. $7.48 + 5.34 \leq 6.75n$
H. $7(7.48 + 5.34) \leq 6.75n$
J. $3(7.48) + 4(5.34) \leq n$
K. $3(7.48) + 4(5.34) \leq 6.75n$

Understanding Algebraic Operations

4. $t^2 - 59t + 54 - 82t^2 + 60t$ is equivalent to:

F. $-26t^2$
G. $-26t^6$
H. $-81t^4 + t^2 + 54$
J. $-81t^2 + t + 54$
K. $-82t^2 + t + 54$

6. The expression $(4z + 3)(z - 2)$ is equivalent to:

F. $4z^2 - 5$
G. $4z^2 - 6$
H. $4z^2 - 3z - 5$
J. $4z^2 - 5z - 6$
K. $4z^2 + 5z - 6$

8. The 6 consecutive integers below add up to 447.

$x - 2$
$x - 1$
x
$x + 1$
$x + 2$
$x + 3$

What is the value of x ?

F. 72
G. 73
H. 74
J. 75
K. 76

46. If $a < b$, then $|a - b|$ is equivalent to which of the following?

F. $a + b$
G. $-(a + b)$
H. $\sqrt{a - b}$
J. $a - b$
K. $-(a - b)$

YOU TRY Understanding Algebraic Operations:

1. $(x + 2)(x - 4) - (x + 4)(x - 2) = ?$

F. 0
G. $2x^2 + 4x - 16$
H. $-4x$
J. $4x$
K. $-4x - 16$

2. The expression $5(x - 1)$ is equivalent to:

A. $5x - 5$
B. $5x - 4$
C. $5x - 1$
D. $x - 5$
E. $-5x$

3. If $-2x + 5 = 2 - (5 - 2x)$, then $x = ?$

F. 6
G. 5
H. 4
J. 3
K. 2

4. What is the solution of $5y + 3 = 2y - 18$?

F. -7
G. -5
H. -3
J. 5
K. 7

5. For 2 numbers, c and d, c is 4 less than the product of 3 and the number d. Which of the following is an expression for c, in terms of d?

A. $3(d + 4)$
B. $3(d - 4)$
C. $4 - 3d$
D. $3d + 4$
E. $3d - 4$

6. Which of the following expressions correctly describes the mathematical relationship below?

3 less than the product of 4 times x

F. $4x - 3$
G. $3x - 4$
H. $4(x - 3)$
J. $3(4x)$
K. $\frac{4x}{3}$

7. If $\frac{3}{4}$ of x is 36, then $\frac{1}{3}$ of x = ?

A. 9
B. 12
C. 16
D. 24
E. 42

8. If $12 + x = 36 - y$, then $x + y$ = ?

F. -48
G. -24
H. 3
J. 24
K. 48

9. For a positive integer k, which of the following equals 6k + 3?

F. $\frac{1}{2}(k + 1)$
G. $\frac{1}{k} + 4$
H. 2k + 1
J. 3(k + 1)
K. 3(2k + 1)

Solution of quadratic equations by factoring

21. What values of x are solutions for $x^2 + 2x = 8$?

A. –4 and 2
B. –2 and 0
C. –2 and 4
D. 0 and 2
E. 6 and 8

YOU TRY Solution of quadratic equations by factoring:

1. Which of the following is an element of the solution set of the equation $x^2 + 6x + 8 = 0$?

A. -8
B. -2
C. 4
D. 6
E. 8

2. If 1 of the roots of the equation $x^2 + kx - 12 = 0$ is 4, what is the value of k?

F. -1
G. 0
H. 1
J. 3
K. 7

3. Which of the following represents $-7t + 6t^2 - 3$ when it is completely factored?

A. (3t – 1)(2t + 3)
B. (3t + 1)(2t – 3)
C. (6t – 1)(t + 3)
D. (6t + 1)(t – 3)
E. (2t – 1)(3t + 3)

4. What is the solution set for the following equation: $x^2 - 5x + 4 = 0$?

A. {-4, -1}
B. {-3, -1}
C. {-1, 3}
D. {1, 4}
E. {2, 3}